NATIONAL RESEARCH COUNCIL

COMMISSION ON PHYSICAL SCIENCES, MATHEMATICS, AND APPLICATIONS

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December 19, 1994

Ms. Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: ET Docket No. 94-32

In the Matter of
Allocation of Spectrum Below 5 GHz
Transferred from Federal Government Use

Dear Ms. Searcy:

Transmitted herewith by the Committee on Radio Frequencies, operated by the National Research Council for the National Academy of Sciences, are an original and nine (9) copies of its Comments to the Notice of Proposed Rulemaking in the above-referenced proceedings.

If additional information is required concerning this matter, please communicate with this office.

Sincerely yours,

Robert L. Riemer

Robert L. Riemer
Senior Program Officer

Enclosure

cc: Members of CORF
Mr. Paul J. Feldman

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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	)	
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COMMENTS OF THE
NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

The National Academy of Sciences, through the National Research Council's Committee on Radio Frequencies (hereinafter, "CORF"), hereby submits its comments in response to the Commission's Notice of Proposed Rulemaking, FCC 94-272, released November 8, 1994, in the above-captioned proceeding ("NPRM"). CORF represents the interests of the Earth Exploration--Satellite Service, the Space Research Service, the Radio Astronomy community, and other users of the radio spectrum engaged in scientific research.[1] In these Comments, CORF requests that the

[1]Although these comments will generally refer to radio astronomy, it should be noted that the concerns of radio astronomers are generally shared by all passive radio users, such as those operating in the Earth Exploration--Satellite Service and the Space Research Service.

Commission explicitly place limited restrictions in its rules on the use of the reallocated 2390-2400 and 2402-2417 MHz bands in order to protect the important planetary research conducted at the National Astronomy and Ionospheric Center ("NAIC") at Arecibo, Puerto Rico.

I. Introduction

This proceeding was commenced subsequent to a Preliminary Spectrum Reallocation Report (the "Report") issued by the National Telecommunications and Information Administration ("NTIA"). That Report recognized that radio astronomy constitutes such a unique, immensely important,[2] yet easily interfered with,[3] use of the

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[2]As noted in more detail in Comments submitted in response to the Notice of Inquiry in this proceeding, radio astronomy is a vitally important tool used by scientists to study our universe. For example, through the use of radio astronomy, scientists have recently discovered the first planets outside the solar system, circling a distant pulsar. Furthermore, as noted in the Report, in addition to increasing knowledge of our world and the universe, radio astronomy has produced substantial benefits through the development of very-low-noise receivers and many other applications used in a variety of other radio applications.

In addition, the technique of very-long-baseline interferometry ("VLBI"), developed for cosmic observations, is increasingly producing substantial benefits through use in terrestrial observations, including measurements of global distances (e.g., identification of potential earthquake zones through measurement of fault motion), and through major contributions to navigation, including the tracking of spacecraft.

The continuing flow of benefits and research results from radio astronomy, founded on years of work and substantial federal investment, must be protected.

spectrum, that those portions of the spectrum currently allocated exclusively to the Radio Astronomy Service ("RAS") should retain that exclusive allocation and that the reallocation of neighboring frequency bands should be subject to conditions that restrict potential harm to radio astronomy. CORF and Cornell University submitted Comments in response to the Commission's Notice of Inquiry supporting the protections recommended by NTIA.[4]

While CORF was pleased that the Commission recognized some of these issues in the body of the NPRM, it is concerned that no specific protections consistent with these issues were placed in the proposed rules set forth in Appendix F of the NPRM. The

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[3]The emissions that radio astronomers detect are extremely weak--a typical radio telescope receives only about one-trillionth of a watt from even the strongest cosmic source. Radio astronomy is therefore particularly vulnerable to interference not only from licensed and unlicensed users in bands allocated to radio astronomy, but from spurious and out-of-band emissions from users of neighboring bands.

[4]Concern for the protection of services such as RAS is also mandated in Title VI of the Omnibus Budget Reconciliation Act of 1993. Therein, Congress recognized that in analyzing which frequency bands should be reallocated, that substantial degradation of existing government uses of spectrum, and costs to existing users, must be weighed against potential benefits of future uses. See Sec. 6001 of the Act, adding Sec. 113(c)(1)(C) to the National Telecommunications and Information Administration Organization Act: "[the Secretary shall] seek to avoid--(i) serious degradation of Federal Government services and operations; (ii) excessive costs to the Federal Government and users of Federal Government Services..."

specific protections proposed herein will not substantially burden commercial users and are necessary to protect important and irreplaceable frequency bands used for research conducted by radio astronomers and other passive users of the spectrum.

II. Restrictions on the Use of the 2390-2400 and 2402-2417 MHz Bands Are Necessary to Protect Important Research Operations.

While radio astronomers are concerned about protecting the bands which are primarily allocated to RAS, they must also take great interest in other bands: due to the extreme sensitivity of radio astronomy receivers, radio astronomers are very vulnerable to the spurious emissions from services in bands next to the bands being reviewed. Such emissions can be as harmful to research as those from the same band.

As the Commission has recognized, the NAIC performs important planetary radar research at 2380 MHz using the world's largest radio/radar telescope. Research from this facility has resulted in major contributions to knowledge of the solar system, including mapping of the surfaces of Venus and asteroids, and detection of orbital debris. The NAIC facility also is one of the few sites in the world available to use radar to watch for near-Earth objects.

These objects, if they collide with the Earth, could prove devastating to safety and even civilization itself.[5]

Without the proper protections, the reallocation of the 2390-2400 and the 2402-2417 MHz bands poses a substantial threat to the effectiveness of the NAIC facilities. Accordingly, the NTIA Report proposed[6] prohibiting airborne or space-to-earth links in the 2390-2400 MHz band and placing limitations on terrestrial operations in Puerto Rico in the 2390-2400 MHz band. CORF and Cornell University filed comments in response to the Commission's

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[5]The Federal Government has invested hundreds of millions of dollars in the NAIC as well as in other radio astronomy observatories throughout the country. See, NTIA Report at Figure 2-5.

[6]The NTIA Report recommends protection for the National Aeronautics and Space Administration's Deep Space Network and for the NAIC at page 4-17: "After weighing the Federal impact and the public benefits factors, reallocation of 2300-2310, 2390-2400, and 2402-2417 MHz bands for exclusive non-Federal use is considered feasible. However, it is essential that certain limitations be placed on services that could be implemented. Specifically, allowing airborne or space-to-earth links in the 2300-2310 and 2390-2400 MHz bands would be detrimental to Federal Government operations in adjacent bands and must not be permitted. Limitations on terrestrial operations in these two bands in the vicinity of the Goldstone, California Deep Space Network facility would also merit further study. The Deep Space Network, critical to the national space program, cannot be terminated, replaced, or moved to other bands and therefore must be adequately protected from interference. Limitations on terrestrial operations in the 2390-2400 MHz band may also have to be imposed on the island of Puerto Rico, due to the presence and functions of the Arecibo Observatory's Planetary Radar, where similar considerations apply."

Notice of Inquiry, supporting such proposals. While the NPRM referred to these Comments (at note 26), CORF is concerned that the proposed rules provide for a general allocation for Fixed and Mobile services, with no notes providing the specific protections called for in the NTIA Report.

CORF is particularly concerned that the proposed Mobile services allocation could include aeronautical uses. Any aeronautical services making air-to-ground communications in these bands would be very damaging to research conducted at the NAIC. Similarly, either Fixed or Mobile terrestrial services in these bands operating in Puerto Rico could create a substantial threat to the NAIC operations.[7]

Accordingly, CORF requests that the Commission add footnotes to the proposed allocations at 2390-2400 MHz and 2402-2417 MHz, specifically prohibiting any aeronautical use by Mobile services in those frequencies. Furthermore, the Commission should also add footnotes prohibiting any terrestrial use by Fixed or Mobile

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[7]The NPRM states that two commenters have suggested use of the 2390-2400 MHz band for downlinks in the Mobile Satellite Service. Any such use would be substantially damaging to operations at the NAIC. CORF is gratified that the revisions to the Table of Allocations set forth in Appendix F of the NPRM do not provide for MSS. However, if the Commission were to consider allocating these frequencies to the MSS in the future, at the very least it must prohibit use for MSS downlinks.

services in the 2390-2400 MHz band within 100 miles of the NAIC[8] or in the 2402-2417 MHz band within 30 miles of the NAIC.[9] While such restrictions would protect valuable planetary research operations, they are sufficiently limited, geographically and technologically, to allow for use in a wide variety of new terrestrial services.[10]

III. Conclusion

The portion of the spectrum that is used by radio astronomers is a unique resource that has produced, and will continue to produce, remarkable cosmic discoveries, important information about our planet, and tangible technological benefits used in a

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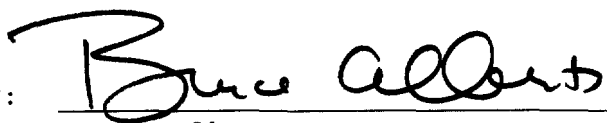
[8]The coordinates of the NAIC are 18° 20′ 46″ north and 66° 45′ 11″ west.

[9]The difference in the proposed distances is that the 2402-2417 MHz frequencies have more spectral separation from the 2380 MHz operations at the NAIC.

[10]CORF also remains concerned that harmonic emissions from stations transmitting at 2412-2418 MHz can interfere with the 4825-4835 MHz band, where the RAS has secondary status internationally and US footnote 203 protection in order to protect spectral line and continuum observations. CORF will participate in the future proceedings enacting service rules for the 2402-2417 MHz band and will propose specific standards to prevent transmitters in this band from producing signals above the harmful thresholds in the 4830 MHz band. However, for the sake of efficiency, CORF urges the Commission to consider these issues in the present proceeding when selecting the services to be allocated to the 2402-2417 MHz band.

variety of radio communications services. Yet, radio astronomers' use of this small fraction of the useable spectrum is uniquely susceptible to interference, and thus it must be carefully guarded in the coming years. While CORF recognizes the Congressional imperatives that require the reallocation of certain portions of the spectrum, Congress--and the NTIA--also recognized the need to weigh the potential benefits of new spectrum-based services against the detrimental impact of such services on existing users. In the case of the 2390-2400 and 2402-2417 MHz bands, the limited restrictions proposed herein will have little impact on any new commercial uses, but will produce a substantial benefit of protecting valuable planetary research facilities at the NAIC. Therefore, footnotes should be added to the allocations for Fixed and Mobile services using the 2390-2400 and 2402-2417 MHz bands prohibiting aeronautical uses and limiting terrestrial use in Puerto Rico.

Respectfully submitted,
NATIONAL ACADEMY OF SCIENCES'
COMMITTEE ON RADIO FREQUENCIES

By: 

Bruce Alberts
President

December 19, 1994

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